Astro2010
Progress Report

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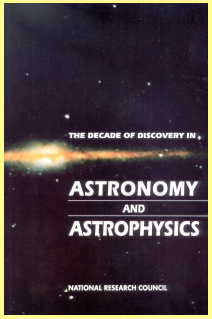
Stanford
(On behalf of the Astro2010 Survey Committee)

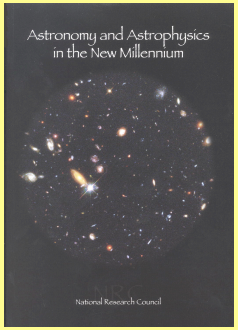
THE NATIONAL ACADEMIES
Advisers to the Nation on Science, Engineering, and Medicine

AAS Long Beach. 6 i 2009

Astro 2010

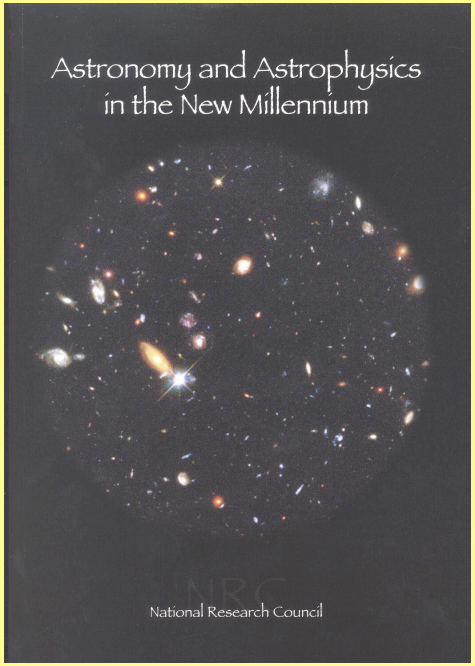


Decadal Surveys



- **1964: Ground-based Astronomy: A Ten Year Program (Whitford)**
- **1972: Astronomy and Astrophysics for the 1970s (Greenstein)**
- **1982: Astronomy and Astrophysics for the 1980s (Field)**
- **1991: The Decade of Discovery in Astronomy and Astrophysics (Bahcall)**
- **2001: Astronomy and Astrophysics in the New Millennium (McKee-Taylor)**
- **2010: ???**

Astronomy and Astrophysics in the New Millenium



- Executive Summary
- Recommendations
  - Optimizing the Return
  - New Investments
  - Education
- Science
- New Initiatives
- Benefits to the Nation
- Education
- Policy

Seven Panel Reports
Semi-Popular Book

Optimizing the Return

Operational
Agency start
Not started

- DDAA carryover
  - Spitzer, ALMA, SOFIA, SIM, WMAP, FIRST, Planck
- Budget for operations, upgrade, data, theory
- Unrestricted research grants
- Develop OIR system in ground-based astronomy
- NSF Senior Reviews
- DOE Strategic Plan for Astrophysics
- NASA develop balanced program - small, medium, large
- Integrated theory initiatives
- Inter-agency, international and private coordination, collaboration and cost-sharing

New missions, facilities

	SPACE		GROUND	
MAJOR	JWST	1000	GSMT	350
	Con-X	800	EVLA	140
	TPF(tech)	200	LSST	170
	SAFIR(tech)	100		
MODERATE	GLAST	300	TSIP	50
	LISA	250	ATST	60
	SDO	300	SKA(tech)	22
	EXIST	150	CARMA	11
	ARISE	350	VERITAS	35
			FASR	26
			SPST	50

(FY2000 costs in M$ for construction and 5 yr operations in 2001-2010 interval)

Examples of Additional Proposals

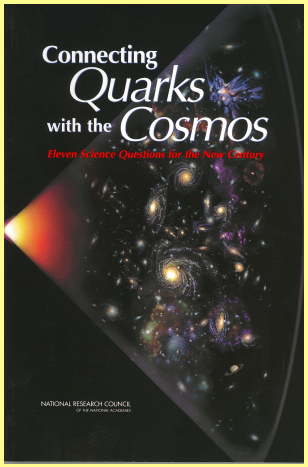
SPACE	GROUND
▪ KEPLER	▪ MWA
▪ HST/SM4	▪ LWA
▪ WISE	▪ ACT
▪ NuSTAR	▪ LBT
▪ JDEM	▪ CCAT
▪ CMBPOL	▪ …
▪ …	

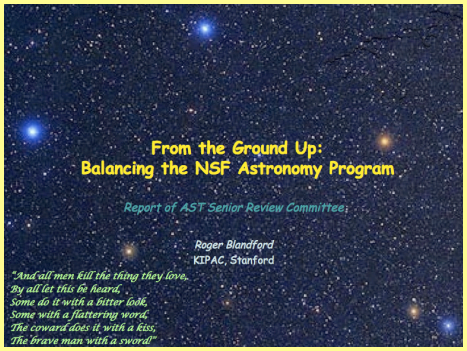
2009 Status of Initiatives

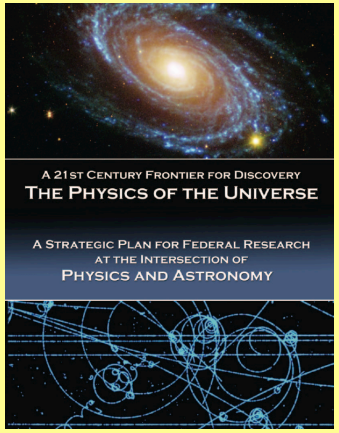
- **Spitzer, WMAP, Fermi(GLAST) CARMA, VERITAS, SPT**
- **JWST, ALMA, SOFIA, FIRST(Herschel), Planck, Kepler, SM4, WISE, NuSTAR, MWA, LWA, ACT, LBT**
- **SIM, Con-X(IXO), TPF, SAFIR,GSMT, LSST, LISA, EXIST, ARISE, ATST, SKA, FASR, JDEM, CMBPOL, CCAT…**
- **Many new Proposals**
- **Cross-Disciplinary projects**

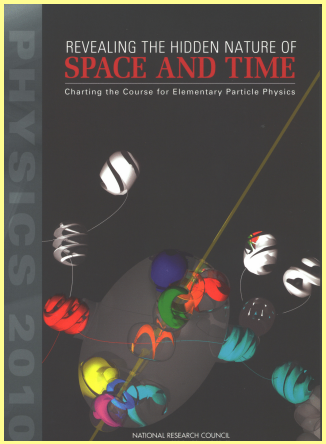
Good News: Superabundance of scientifically exciting projects
Bad News: No credible budget can support starting all of them
Conclusion: Many opportunities must be passed up

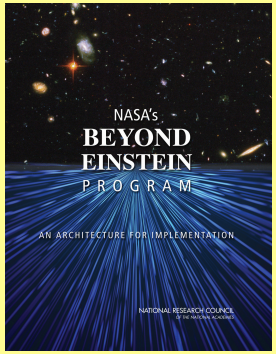
Many recent reports available to the Astro2010 committee

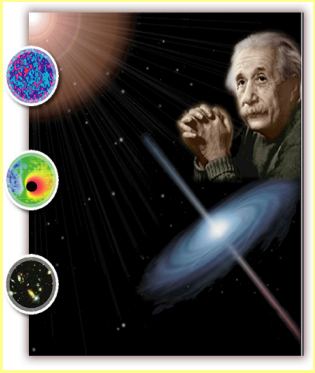


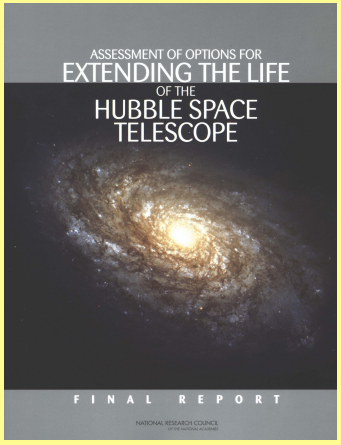


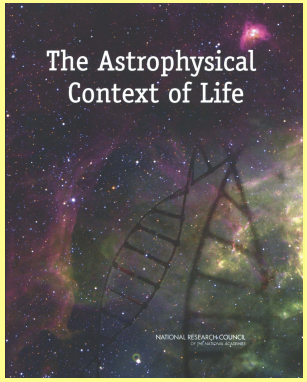


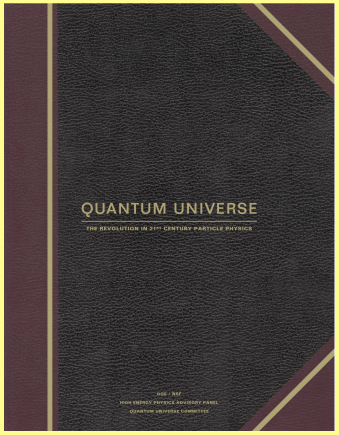












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Astro 2010

Other Reports

- 2003: Connecting Quarks with the Cosmos (Turner)*
- 2003: Beyond Einstein: From the Big Bang to Black Holes (Phinney)
- 2004: The Physics of the Universe (OSTP)
- 2004: The President's Vision for Space Exploration (White House)
- 2004: The Quantum Universe (Drell)
- 2004: TPF Letter Report (Freedman)*
- 2005: Astrophysical Context of Life (Szostak-Wheeler)*
- 2005: Mid-Course Review (Urry)*
- 2005: Options for Extending the Life of HST (Lanzerotti)*
- 2006: Revealing the Hidden Nature of Space and Time (Shapiro)*
- 2006: From the Ground Up – NSF/AST Senior Review (Blandford)
- 2006: AAAC – Dark Energy Task Force (Kolb)
- 2007: NASA Astrophysics Performance Assessment (Keller)*
- 2008: Beyond Einstein Program Assessment Committee (Kennel)*
- 2008: AAAC- Exoplanet Task Force (Lunine)

* = NRC

2009 Status of Initiatives

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- **JWST, ALMA, SOFIA, FIRST(Herschel), Planck, Kepler, SM4, WISE, NuSTAR, MWA, LWA, ACT, LBT**
- **SIM, Con-X(IXO), TPF, SAFIR,GSMT, LSST, LISA, EXIST, ARISE, ATST, SKA, FASR, JDEM, CMBPOL, CCAT…**
- **Many new Proposals**
- **Cross-Disciplinary projects**

Good News: Superabundance of scientifically exciting projects
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Astro2010 Charge

- **The Astro2010 committee will survey the field of space- and ground-based astronomy and astrophysics, recommending priorities for the most important scientific and technical activities of the decade 2010-2020.**
- **The principal goals of the study will be to carry out an assessment of activities in astronomy and astrophysics, including both new and previously identified concepts, and to prepare a concise report that will be addressed to the agencies supporting the field, the Congressional committees with jurisdiction over those agencies, and the scientific community.**

[http://www.nationalacademies.org/astro2010]

Astro2010 Survey Committee (ASC)

Roger Blandford, Chair, Stanford University
Lynne Hillenbrand, Executive Officer, California Institute of Technology

Subcommittee on Science

Martha P. Haynes, Vice Chair – Science Frontiers, Cornell University
Lars Bildsten, University of California, Santa Barbara
John E. Carlstrom, The University of Chicago
Fiona A. Harrison, California Institute of Technology
Timothy M. Heckman, Johns Hopkins University
Jonathan I. Lunine, University of Arizona
Juri Toomre, University of Colorado at Boulder
Scott D. Tremaine, Institute for Advanced Study

Subcommittee on State of the Profession

John P. Huchra, Vice Chair – State of the Profession, Harvard-University
Debra M. Elmegreen, Vassar College
Joshua Frieman, Fermi National Accelerator Laboratory
Robert C. Kennicutt, Jr., University of Cambridge
Dan McCammon, University of Wisconsin-Madison
Neil de Grasse Tyson, American Museum of Natural History

Subcommittee on Programs

Marcia J. Rieke, Vice Chair – Program Prioritization, University of Arizona
Steven J. Battel, Battel Engineering
Claire E. Max, University of California, Santa Cruz
Steven M. Ritz, NASA Goddard Space Flight Center
Michael S. Turner, The University of Chicago
Paul Adrian Vanden Bout, National Radio Astronomy Observatory
A. Thomas Young, Lockheed Martin Corporation [Retired]

Subcommittee on Science

- **Chair: Haynes**
  - **Bildsten, Carlstrom, Harrison, Heckman, Lunine, Toomre, Tremaine**
- **Five Science Frontiers Panels (SFP)**
  - **NRC Committees**
  - **Write Panel Reports**
  - **Four central questions**
  - **One area of unusual discovery potential**
- **Recommend:**
  - **An integrated scientific observational and theoretical research program using panel reports**
- **Draft Science portion of report**

Science Frontier Panels

Planetary Systems and Star Formation (PSF), Lee Hartmann

- Solar system bodies (other than the Sun) and extrasolar planets, debris disks, exobiology, formation of individual stars, protostellar and protoplanetary disks, molecular clouds and the cold ISM, dust, and astrochemistry.

Stars and Stellar Evolution (SSE), Roger Chevalier

- The Sun as a star, stellar astrophysics, structure and evolution of single and multiple stars, compact objects, supernovae, gamma-ray bursts and solar neutrinos. Extreme physics on stellar scales.

The Galactic Neighborhood (GAN), Mike Shull

- Structure and properties of nearby galaxies including the Milky Way and their stellar populations, interstellar media, star clusters. Evolution of stellar populations.

Galaxies across Cosmic Time (GCT), Meg Urry

- Formation and evolution of galaxies and galaxy clusters, active galactic nuclei and QSOs, mergers, star formation rate, gas accretion, global properties of galaxies and galaxy clusters, supermassive black holes.

Cosmology and Fundamental Physics (CFP), David Spergel

- Early universe, microwave background, reionization and galaxy formation up to virialization of protogalaxies. Large scale structure, intergalactic medium, determination of cosmological parameters, dark matter, dark energy. High energy physics using astronomical messengers, tests of gravity, physical constants as determined astronomically.

Subcommittee on State of Profession

- Chair: Huchra
  - Elmegreen, Friemann, Kennicutt, McCammon, Tyson
- Six Infrastructure Study Groups (ISG)
  - Consultants
  - Primarily fact-finding and verification
  - Produce graphical and tabular data
  - Chairs continue to consult with committee
- Recommendations
  - State of field. How to maintain and improve
  - Infrastructure and policy issues
- Draft relevant portions of report

Infrastructure Study Groups

Computation (COM)

- Numerical simulation and data handling…

Demographics (DEM)

- Discipline, gender, ethnicity, location, institution…

Infrastructure (INF)

- Telescopes, facilities, instruments, centers, institutes…

Private and International Partnerships (PIP)

- Existing and proposed collaborations; how they work…

Education and Public Outreach (EPO)

- Schools, undergraduates, graduates, media, museums…

Astronomy and Public Policy (APP)

- Benefits to the nation, contributions to other fields…

Subcommittee on Programs

- **Chair: Rieke**
  - **Battel, Max, Ritz, Turner, Vanden Bout, Young**
- **Four Programmatic Prioritization Panels (PPP)**
  - **NRC committees**
  - **Write panel reports**
- **Recommend:**
  - **Synthesize panel reports into a prioritized, cost-constrained and balanced program for next decade**
    - Independent contractors evaluate construction and full running cost, schedule, risk for major contenders.
  - **Research technology development program to enhance existing capabilities and enable missions starting in the following decade**
- **Draft program part of report**

Programmatic Prioritization Panels

Radio, Millimeter and Submillimeter from the Ground (RMS)

- **Observatories and telescopes that observe primarily in these wavebands**

Optical and Infrared Astronomy from the Ground (OIR)

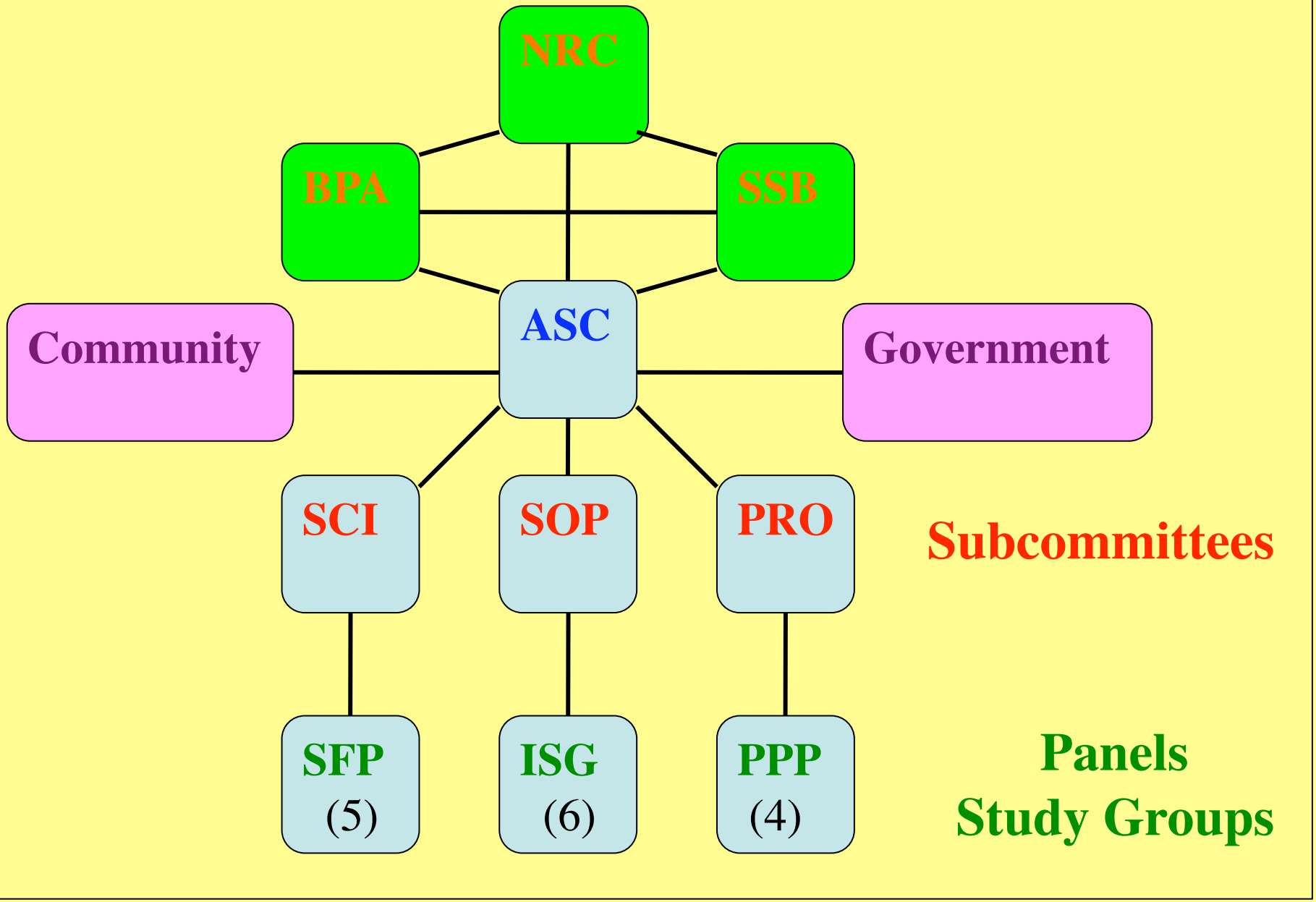
- **Observatories and telescopes that observe primarily in these wavebands**

Electromagnetic Observations from Space (EOS).

- **This will include all space-based astronomical projects observing the electromagnetic spectrum.**

Particle Astrophysics and Gravitation (PAG)

- **This will include all ground- and space-based projects exploring non-electromagnetic particles and gravitational radiation.**


NRC
BPA
SSB
ASC
Community
Government
SCI
SOP
PRO
SFP
(5)
ISG
(6)
PPP
(4)
Subcommittees
Panels
Study Groups

1st ASC Meeting (Dec 5-6)

- Presentations by DOE, NASA, NSF
- Presented views on:
  - Lessons learned
  - Budget projections
  - Mission status
  - Survey scope
  - Inter-agency, international collaboration
  - Nature of report
  - Advice to us
- Presentations by OSTP, OMB, House Science
- Subcommittee meetings
- Charges to panels, study groups, chairs
- Revision of plan and timeline

Calls for Input

- **Town Hall Meetings:**
  - **Should be organized locally by department chairs, centers, observatories…**
  - **Include your neighbors**
  - **Invite committee members panel, study group chairs**
  - **Please discuss with NRC staff who will provide assistance.**
  - **Submit a written summary**
- **Watch the website**

  http://www.nationalacademies.org/astro2010
  - **White Papers on Science**
  - **Notices of Interest from Activities**
- **Email**

  astro2010@nas.edu

Past advice has been heeded and been influential.
The sooner the better!

Science White Papers

- Address how understanding of astronomical frontiers may be advanced
- Should be addressed to one or more panels
- Multiple submissions allowed
- Identify critical questions and specific opportunities
- Theory, experiment and observation
- Scope of science panels is inclusive, connections to other areas of science are important
- Expecting submissions involving missions that are started or operating as these provide a context for future programs
- AAS Bulletin Boards a great way to organize collaborations on white papers
- 7pp; submit 9-15 Feb; public documents

Activity Notices of Intent

- "Activity" – projects, missions, telescopes, laboratories etc
- Program Subcommittee will decide which activities will be invited to make presentations
- ATST and other ground-based solar telescopes, JDEM, LISA, cosmic ray projects >1GeV, neutrinos from cosmic sources… are currently expected to be prioritized
- Space-based solar, underground DM, planetary science, gravitational and neutrino physics experiments, JWST, AMS, LIGO, SOFIA… will not be prioritized
- Submit by Jan 14 2009

Astro2010 Timeline (provisional)

- December 5 2008 1st meeting ASC
- January 6, 2009 AAS town meeting, sessions
- January 9, 2009 2nd meeting ASC
- January 14 2009 Submission Deadline for Notices of Interest
- January 2009 1st meetings SFP, ISG; start town halls
- February 15 2009 Submission of Science White Papers
- May 4 2009 APS Town meeting, sessions
- May 11 2009 3rd meeting ASC; 1st meeting PPP
- June 8 2009 AAS meeting, PPP workshops
- September 2009 4th meeting ASC; SFP drafts, ISG data
- October 2009 Cost-schedule-risk analysis, SFP review
- December 2009 PPP drafts, ASC recommendations
- January 2010 ASC draft; PPP review
- April 2010 ASC review
- July 2010 Report release and communication of content

Summary

- **Main differences from AANM**
  - **Science, infrastructure =>recommended program**
  - **Include unstarted activities**
  - **Outside consultation on cost, schedule, risk**
- **Committee assembled and hard at work.**
  - **Somewhat stricter conflict of interest criteria**
  - **Meeting deadlines collegially!**
- **Panels and study groups being constituted**
  - **Spanning all of astronomy, trying hard to be inclusive**
  - **Up to 300 people will be involved**
- **Community input has been and continues to be vital**
  - **Science white papers**
  - **http://www.nationalacademies.org/astro2010**
  - **astro2010@nas.edu**

It's your survey. Get engaged now. Support it next year!